

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION**

ORDER No. 97-088

WASTE DISCHARGE REQUIREMENTS FOR:

**DEPARTMENT OF THE ARMY
HEADQUARTERS I CORPS and FT. LEWIS
HAMILTON ARMY AIRFIELD
NOVATO, MARIN COUNTY**

The California Regional Water Quality Control Board, San Francisco Bay Region, (hereinafter Regional Board) finds that:

1. This Order serves as Waste Discharge Requirements for beneficial reuse of contaminated soil, in lieu of off-site disposal, into an engineered berm on the former Hamilton Air Force Base.
2. The soil is predominantly clay- and silt-sized material that contains low levels of petroleum hydrocarbons (TPH), polynuclear aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs).
3. The contaminants are residuals of a treatment process that included segregation and disposal of contaminated materials containing polychlorinated biphenyls (PCBs), pesticides and high concentrations of metals , aeration, and biodegradation. Before the soils are reused in the engineered berm, they will be reworked to improve their geotechnical stability and reduce permeability.
4. Use of materials that are produced by soil treatment are exempt from California Code of Regulations, Title 23, Chapter 15 (Chapter 15) pursuant to Section 2511(h) of that chapter.
5. While many of the principles found in Chapter 15 were used to design the engineered berm, the regulations written for the disposal of untreated, heterogeneous and permeable solid treated soils are not appropriate for the reuse of treated, low permeability soils that will be used as a resource in a wetland environment. The term "low permeability" is used in this document to indicate soils with a permeability of 10^{-6} cm/sec or less. This is the typical criteria used for liners or covers on landfills that do not contain hazardous waste.
6. **Location:** The former Hamilton Air Force Base (Hamilton) is located in Marin County, near the town of Novato (Figure 1).

7. **Responsible Party:** The Department of the Army, Headquarters I Corps and Fort Lewis, Fort Lewis, Washington (hereinafter the discharger) are owners of the property. The U. S. Army Corps of Engineers, Sacramento District has been designated by the Department of Defense to perform necessary investigations and take appropriate remedial actions at Hamilton for the parcels that are still the responsibility of the U. S. Army. Those parcels include support areas that were transferred to the General Services Administration in 1974 (GSA Parcels) and the airfield, that is being closed under the Base Realignment and Closure Act of 1988 (BRAC Parcel).
8. **Site History:** Hamilton Army Air Field opened in 1934 as an Army Air Corps facility to train fighter and bomber pilots. The field was transferred in 1947 from the Army to the U. S. Air Force. Hamilton was listed by the Department of Defense as excess property in 1974. Final cleanup and closure of the base has been delayed by local planning considerations, but selected parcels have been transferred to the private sector over the last three years and additional transfers are scheduled between now and 1999.
9. **Proposed Waste Discharge:** The Army has submitted a proposal to reuse approximately 60,000 cubic yards of treated soil with residual levels that exceed cleanup goals of petroleum hydrocarbons (TPH), polynuclear aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) into an engineered structure (berm) that will be designed to contain the soils. The treated soil has low permeability and it will be covered with clean soil that has low permeability.
10. **Public Benefit:** The proposed reuse of the former airfield at Hamilton is as a 700 acre wetland that will be open to San Pablo Bay. In order to flood the airfield, the current "internal levees" will need to be improved. The berm proposed by the discharger will be the first step in improving the internal levee on the south side of Hamilton. It will provide a structure of known engineering quality that will be capable of supporting the levee that is needed to prevent flooding of the farmlands south of Hamilton.
11. The Regional Board finds that it is in the public interest to reuse the contaminated soil as a foundation for a levee at this site, so long as this is done in a manner to minimize impacts on water quality and the loss of wetland habitat values.
12. The Regional Board as a participant in the Long-Term Management Strategy Program is examining alternative management options for disposal of dredged sediment over a 20-50 year planning horizon. The 700 acre wetland could use up to 7 million cubic yards of dredged material, which would be used to create the shallow water and intertidal conditions that enhance wetland development.

13. The Regional Board finds that it is in the public interest to allow the use of the former Hamilton Air Force Base as one of the designated locations for upland dredge material disposal. The berm and subsequent levee described in this order will facilitate the dredge disposal and wetland restoration.
14. The allowance for these treated soils to be reused on a site that is slated to become a wetland is contingent upon the completion of the levee prior to inundation of the site. The berm has not been designed to withstand wave erosion and it will not prevent flooding of adjacent property.
15. In the event that the planned reuse of Hamilton changes or a levee has not been designed and funded within 5 years of the date of this order, the Regional Board may revise these Waste Discharge Requirements. Revisions would require that the treated soils are managed so as to avoid adverse impacts to human health and the environment. If a levee is not completed, it may be required that the treated soils be removed from Hamilton to an area that would not be flooded by an accidental breach of the current levee system.
16. This strategy to contain treated soils has multiple benefits. The discharger will benefit from the reuse of the treated soils on site, since transportation of the soils to another site would be costly.
17. The public will benefit from the reuse of the soil, since it will reduce the cost of building the levee and reduce the volume of material being taken to landfills. The contaminated soil will be converted into a resource.
18. The design of the berm and the levee will prevent degradation of water quality and the beneficial uses of San Pablo Bay will be enhanced by the addition of 700 acres of tidal and non-tidal wetland.

SITE STATUS

19. The discharger has excavated over 130,000 cubic yards of soil at Hamilton based on Site Specific Cleanup Goals (SSCGs) that were protective of both human health and the environment. The soils to be placed in the berm have been stored on the airfield since early 1995. Detailed characterization has shown that the levels of TPH and VOCs have decreased over time, presumably due to aeration and/or biodegradation. Polynuclear Aromatic Hydrocarbons (PAHs) do not degrade rapidly, but mixing of the soils has reduced some of the higher levels initially detected.
20. As of June 1997 approximately 70,000 cubic yards of the stockpiled soil have been characterized as being below the SSCGs. These soils average less than 16 mg/kg of TPH-diesel and 2 mg/kg of TPH-gasoline Total PAHs average less than 1.7 mg/kg. . These concentrations are within background conditions found in San Pablo Bay.

21. Average levels of Total PAHs in the soils that exceed cleanup goals are less than 1.7 mg/kg and the maximum level is 40 mg/kg. This can be compared to the criteria developed in the 1992 Regional Board document entitled Interim Sediment Screening Criteria and Testing Requirements for Wetland Creation and Upland Beneficial Reuse (Wolfenden and Carlin). In that document it was recommended that soils with up to 4 mg/kg of total PAHs could be used in the upper 3 feet of a created wetland (Cover criteria). Soils with from 4 to 35 mg/kg of total could be used in locations that were covered by at least three feet of soil (Noncover criteria). Only soils with less than 10 mg/kg of total PAH will be accepted into core of the berm.
22. The average concentration of TPH-diesel for soils that will go into the core of the berm is 39 mg/kg and the maximum level is 750 mg/kg. The average concentration of TPH-gasoline for soils that will go into the core of the berm is 1 mg/kg and the maximum level is 13 mg/kg. The average concentrations are below levels that have been associated with degradation of water quality. The maximum concentration areas (hot spots) will be mixed in with lower concentration areas during berm construction.
23. The volatile (and generally more toxic) components of petroleum such as benzene, toluene, ethylbenzene and xylene (BTEX) are not detected in the vast majority of the samples. The BTEX compounds commonly volatilize and leave behind petroleum mixtures known as "long-chain hydrocarbons" or "weathered petroleum". Unfortunately, there is little toxicity data on the so-called "weathered petroleum" mixtures, but it is known that such mixtures move slowly through the subsurface and have limited impact on water quality.
24. The soils with VOCs are being regulated under the Remediation Work Plan, Lot 7 and Outparcels A-5 and A-6 of the GSA Phase I Sale Area, April 1996 that was approved by the California Department of Toxic Substances Control (DTSC) with concurrence of Regional Board and U. S. Environmental Protection Agency staff. These soils will need additional treatment so that they pose no threat to human health before DTSC will approve of placement of the soils in the berm. Levels of VOCs that are protective of human health are also protective of aquatic life, in part because low levels of VOCs diffuse rapidly in the aquatic environment.
25. The discharger has submitted a report entitled Draft Conceptual Design Soil Encapsulation Berms, BRAC Property, Hamilton Army Airfield, Revision B, May 1997, describing the conceptual design of the Berms and including preliminary engineering studies to support the design. This document also includes a report on the preliminary design of the levee (Appendix B, Preliminary Recommended Perimeter Levee Design cross-section).

26. Prior to construction of the new berm, the existing berm will be removed. The existing berm is inadequate as a base for the future levee for several reasons. It is made up of a mixture of construction debris and dredge material, with unknown engineering characteristics. It is unlikely that the foundation of the berm was adequately prepared and former wetland vegetation may provide a seepage pathway at the base of the berm.
27. The berm will be constructed on a clay formation locally known as the Bay Mud, that ranges from 3 feet to over 45 feet thick along the alignment of the berm. While the bulk of the Bay Mud is a low permeability material, the upper portions that have dried out can have permeabilities as high as 10^{-4} cm/sec (Desiccated Bay Mud or DBM). Several feet of the DBM will be excavated during removal of the existing berm. The top foot of the remaining Bay Mud will be moisture conditioned and compacted to ensure that the permeability is less than 10^{-6} cm/sec. It is likely that the permeability of the DBM beneath the berm will continue to decrease due to the increased load and elimination of desiccating conditions.
28. Soil that exceeds the SSCGs will be placed on the conditioned Bay Mud and covered with three feet of low permeability material. The first two feet will be soils that were excavated and later determined to be below cleanup goals (BCG). Characterization has shown that the majority of these soils are uncontaminated materials that were removed along with contaminated materials during the excavation process. The top foot of cover will consist of uncontaminated soils that were removed from the existing berm.
29. The levee will be created by adding low permeability material to the berm to bring the elevation up to at least +8 feet NGVD and to build a sloping surface from the levee into the wetland. A preliminary levee cross-section was included as Appendix B in the Encapsulation Berm Conceptual Design. It recommended a slope of at least 7:1 in the upper intertidal zone to reduce wave energy and encourage a wide band of aquatic vegetation to stabilize the levee.

PROJECT DESIGN

30. The berms will be the first phase of construction of a berm/levee system that will ultimately be responsible to keep the bay waters off adjacent properties. The berm will be constructed in two sections at right angles to each other (Figure 2). The two sections will not be connected until the levee is completed to allow for continued drainage of the site and avoid disturbance of habitat.

31. The berm/levee system will be constructed in two phases for several reasons:
- a) The berm should be completed this construction season because:
 - 1) the sources of funding will be reduced after this construction season;
 - 2) the berm materials will have time to consolidate and gain strength before adding the levee materials; and
 - 3) the treated soils will be isolated in a timely manner.
 - b) The levee should be built in the future because:
 - 1) the foot print of the levee will encroach on a ditch that is needed for site drainage and the remedial work planned for the ditch will not occur this year;
 - 2) the source of funding for the levee has not been identified; and
 - 3) the source of construction materials to complete the levee has not been identified; and
 - 4) the party responsible for completing the levee has not yet been identified.
32. The crest of the berm will be 2 to 3 feet above the National Geodetic Vertical Datum (NGVD). The levee will be constructed at least 6 months later and will cover the two berms. The recommended elevation of the levee crest is +8 feet NGVD to account for the 100 year high tide and maximum wave.
33. The berm will be constructed so that it is compatible with the levee construction in all aspects. This includes the requirement that the berm be able to support the weight of a +8 foot NGVD levee without reducing the slope stability factors of safety below 1.3.
34. The preliminary estimates indicate that the quantity of soil that will be encapsulated in the berm is about 60,000 cubic yards. The material overlying the treated soil will consist of a minimum of three feet of low permeability material. The material below the soil will be compacted to a low permeability for at least 1 foot of depth.
35. **Seepage:** As with any levee system there will be some seepage through the levee after the airfield is flooded. The seepage has been estimated at about 1 gallon per foot of levee per day. Of this amount, only a small fraction will pass through the treated soils according to the preliminary seepage estimates. More detailed engineering analyses will be included with the Detailed Design Report, to be submitted.

36. **Soil Preparation:** The soils to be used in construction of the berm have been stored on the Hamilton airfield since early 1995. The soils were covered during the rainy season, but were at least partially exposed to the sun and air during the summer months. Since May of this year, the soil piles have been reworked to develop the appropriate geotechnical characteristics needed to create the berm.
37. **Stability Analyses:** The geotechnical conditions at the site were characterized based on a field exploration program and laboratory testing. The berm design was evaluated for various static stability, settlement and seismic conditions in the Conceptual Design Report. Detailed studies of the engineering considerations will be included in the Detailed Design Report. A summary of the preliminary results are as follows:
- a. **Static Stability:** The static factors of safety immediately after construction of the berms range from 1.3 to 1.5. Over time the stability of the berm is expected increase as consolidation of the Bay Mud occurs.
- b. **Settlement:** The Bay Mud will experience settlement under the weight of the proposed berm and future levee. Most of the settlement is expected to occur during the placement of the fill materials. However, long-term settlements of up to 4 feet are possible.
- c. **Seismic Stability:** The berm will be designed so that its integrity will be maintained when subjected to the maximum credible earthquake event. Although the berm (and levee) may be deformed during an earthquake, the structure will be built to minimize the risk of failure.
38. **Depth to Groundwater:** This berm will not have a minimum separation of 5 feet between the treated soil and the highest anticipated groundwater. It is likely that the soils will eventually be in contact with groundwater after the airfield is converted to a wetland, but the flow rates in the low permeability materials will be very slow. Water quality will be protected by the low permeability of the treated soil and of the soils surrounding the treated soils. In addition, only treated soils with low levels of contamination will be accepted at this site.

39. **Soil Acceptance Criteria:** Only uncontaminated soils or soils that have been excavated from the former Hamilton Air Force Base prior to the June 1997 may be used in the berm construction. Soils with less than the following levels of contaminants will be accepted for placement in the core of the berm:

Total Petroleum Hydrocarbons	
TPH - gasoline.....	750 mg/kg
TPH - diesel.....	1000 mg/kg
Volatile Organic Compounds	
Vinyl Chloride	0.0047 mg/kg
Total VOCs (except BTEX* and vinyl chloride)	0.10 mg/kg
Benzene	0.84 mg/kg
Ethylbenzene.....	3400 mg/kg
Toluene	2700 mg/kg
Xylenes (total)	980 mg/kg
Polynuclear Aromatic Hydrocarbons	
Total PAHs	10 mg/kg
*BTEX indicates the compounds Benzene, Toluene, Ethylbenzene and Xylene.	

40. **California Environmental Quality Act:** This action is exempt from the California Environmental Quality Act pursuant to Section 15302, Title 14 of the California Code of Regulations.
41. **Beneficial Uses:** The Regional Board adopted a revised Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) on June 21, 1995. This updated and consolidated plan represents the Board's master water quality control planning document. The revised Basin Plan was approved by the State Water Resources Control Board and the Office of Administrative Law on July 20, 1995, and November 13, 1995, respectively. A summary of regulatory provisions is contained in 23 California Code of Regulations 3912. The Basin Plan defines beneficial uses and water quality objectives for waters of the State, including surface waters and groundwaters.

42. The Board amended its Basin Plan on September 16, 1992, and the State Board approved it on April 27, 1993, with approval from the State Office of Administrative Law pending. Section 1 of the 1992 Basin Plan amendments, "Implementation of Statewide Plans," was remanded by the State Board on June 23, 1994, due to its reliance on the two Statewide Plans that are no longer legally in effect. The Basin Plan identifies beneficial uses and water quality objectives for surface and ground waters in the region, as well as discharge prohibitions intended to protect beneficial uses.
43. The potential beneficial uses of groundwater in the vicinity of the site include industrial process water supply, industrial service water supply, and agricultural water supply. Groundwater underlying the BRAC Parcel exceeds the State Water Resource Control Board's sources of drinking water limit of 3000 ppm total dissolved solids (State Board Resolution No. 88-16), therefore beneficial uses do not include municipal supply. In addition, the groundwater does not have a potential beneficial use of freshwater replenishment of surface waters due to the low permeability of the soils and the salinity of the groundwater.
44. The beneficial uses of the surface waters of San Pablo Bay waters are as follows:
 - a. Navigation
 - b. Water contact recreation
 - c. Non-water contact water recreation
 - d. Industrial service supply
 - e. Wildlife habitat
 - f. Fish spawning
 - g. Ocean, commercial, and sport fishing
 - h. Preservation of rare and endangered species
 - i. Fish migration
 - j. Shellfish harvesting
 - k. Estuarine habitat
45. The Board has notified the discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the treated soil reuse, and has provided them with an opportunity to submit their written views and recommendations.
46. The Board in a public meeting heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that the U. S. Army Corps of Engineers, Sacramento District shall meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder and shall also comply with the following:

A. PROHIBITIONS

1. The release of treated soils or hazardous materials in a manner which will degrade, or threaten to degrade, water quality or adversely affect, or threaten to adversely affect, the beneficial uses of the waters of the State is prohibited.

B. SPECIFICATIONS

1. The storage, handling, treatment or disposal of soil and groundwater containing pollutants shall not create a nuisance as defined in Section 13050(m) of the California Water Code.

C. PROVISIONS

1. The discharger shall perform all investigation and cleanup work in accordance with the requirements of this Order. All technical reports submitted in compliance with this Order shall be satisfactory to the Executive Officer, and, if necessary, the discharger may be required to submit additional information.
2. To comply with all of the Prohibitions, Specifications and Provisions of this Order the discharger shall meet the following compliance task and time schedule:

COMPLIANCE TASK AND DATES

Task 1: The discharger shall submit a **Final Conceptual Design Report** acceptable to the Executive Officer. A draft report entitled Draft Conceptual Design Soil Encapsulation Berms, BRAC Property, Hamilton Army Airfield, Revision B, May 1997 has already been submitted.

REPORT DUE DATE: 14 days prior to the initiation of berm construction.

Task 2: The discharger shall submit a **Detailed Design Report** acceptable to the Executive Officer. This report shall contain details of the construction of the berm including the protocols and results of the engineering studies described in the Draft Conceptual Design Report (seepage, seismic, geotechnical stability analysis, and permeability data).

This report should indicate a plan to evaluate the chemical condition of the existing levee materials, since these are planned for reuse in the berm. This plan should include visual observation, and air sampling during movement of the material and at least six samples of the material for TPH,

PAHs, metals and pesticides. Additional samples may be necessary if the material is very heterogeneous.

This report should indicate how the design will be compatible with the construction of a levee over the berm that has a design height of +8 feet NGVD and a minimum crest width of 16 feet.

REPORT DUE DATE: 14 day s prior to the initiation of berm construction.

Task 3: The discharger shall submit a **Construction Workplan Report** acceptable to the Executive Officer. This report shall contain the details of the work to be performed during construction of the berm.

REPORT DUE DATE: 14 days prior to the initiation of berm construction.

Task 4: The discharger shall submit **Operation and Maintenance Plan** for the berm that shall contain:

- a) an Inspection Plan acceptable to the Executive Officer for visual observations of the berm on a semiannual basis (or more frequently as needed) to detect unacceptable settlement, slope instability, erosion or other damage to the structure;
- b) a Contingency Plan acceptable to the Executive Officer to be instituted if unacceptable settlement, slope instability, erosion or other damage to the structure is observed.
- c) a Notification Plan acceptable to the Executive Officer to be instituted if unacceptable settlement, slope instability, erosion or other damage to the structure is observed;
- d) Post-Earthquake Inspection and Corrective Action Plan acceptable to the Executive Officer to be implemented in the event of any earthquake generating ground shaking of Richter Magnitude 6.5 or greater at or within 60 miles of the site. The plan shall provide for reporting results of the post-earthquake inspection to the Board within 72 hours of the occurrence of the earthquake. Immediately after an earthquake event causing damage to the perimeter dikes, the corrective action plan shall be implemented and this Board shall be notified of any damage.

REPORT DUE DATE: 60 days after the completion of berm construction.


Task 5: The discharger shall submit a **As-Built Conditions Report** acceptable to the Executive Officer. This report shall document the location of the treated soil and provide information that will be needed to complete the construction of the levee on top of the berm.

REPORT DUE DATE: 90 days after completion of berm construction.

3. Initiation of the levee construction will not occur less than 6 months nor more than 5 years after completion of the berm without approval of the Executive Officer. If the discharger has not found another party willing to complete the levee, the Regional Board will revise the Waste Discharge Requirements and may require removal of the treated soils.
4. The berm shall be monitored on a semi-annual basis until the levee construction starts, to evaluate the degree of settlement of the berm, erosion or other damage.
5. After construction of the levee (which will cover the berm) and upon creation of the wetland, the dry side of the levee shall be monitored for seepage on a semi-annual basis as part of the long-term levee maintenance. The Army shall be responsible to transmit this requirement to any new owners of the property. If seepage occurs, the owners of the property shall evaluate the seepage water and affected soils to determine if there is a threat to human health or the environment. Notification of the status of seeps be made to the Regional Board on an annual basis, once seeps have been detected.
6. If settlement of the berm exceeds predictions and makes the completion of the levee infeasible, the discharger will be required to undertake corrective actions such that the levee can be constructed or the contaminated soil would have to be removed.
7. The discharger shall ensure to the extent practicable that the berm will be adequately designed and built to withstand conditions generated during the maximum credible earthquake. In addition, the discharger shall ensure to the extent practicable that the berm will be adequately designed and built to support the proposed levee under the conditions generated during the maximum credible earthquake.
8. Only soils that have been demonstrated to be non-hazardous and meet the Soil Acceptance Criteria identified above may be reused in the berm. The discharge of any other wastes is prohibited.
9. The discharger shall remove and relocate any treated soils which are discharged at this site in violation of these requirements.
10. All reports pursuant to these Provisions shall be prepared under the supervision of a registered engineer or California Registered Geologist, as appropriate.

11. The discharger shall file with this Board a report of any material change or proposed change in the character, location, or quantity of this treated soil reuse. For the purpose of these requirements, this includes any proposed change in the boundaries of the berm or the ownership of the site.
12. The discharger shall maintain a copy of this Order at the site so as to be available at all times to site operating personnel.
13. This Board considers the property owner and site operator to have continuing responsibility for correcting any problems which arise in the future as a result of this treated soil reuse or related operations.
14. The discharger shall maintain all devices or designed features installed in accordance with this Order such that they continue to operate as intended without interruption except as a result of failures which could not have been reasonably foreseen or prevented by the discharger.
15. The discharger shall permit the Regional Board or its authorized representative, upon presentation of credentials
 - a) entry upon the premises on which treated soils are located or in which any required records are kept;
 - b) access to copy any records required to be kept under the terms and conditions of this Order;
 - c) inspection of any treatment equipment, monitoring equipment, or monitoring method required by this Order; and
 - d) sampling of any discharge or groundwater covered by this Order.
16. These requirements do not authorize commission of any act causing injury to the property of another or of the public; do not convey any property rights; do not remove liability under federal, state or local laws; and do not authorize the discharge of wastes without appropriate permits from other agencies.

I, Loretta K. Barsamian, Executive Officer, do hereby certify that the foregoing is a full, complete, and correct copy of an Order adopted by the California Regional Water Quality Control Board, San Francisco Bay Region, on July 16, 1997.


Loretta K. Barsamian
Executive Officer